

measurement apparatus (e.g., using the analog-to-digital converter and digital-to-analog converter pair 445, 450). Third, attempts to measure the ground bounce voltage V_{gnd} should also be more accurate because the measurement is made by accessing test and reference domains selected and characterized during the manufacturing process, instead of whatever circuit domains happen to be connected to the circuit package leads

The paragraph beginning on page 17, line 10 is amended as follows:

In accordance with the teachings of the present invention, at least one of the memory integrated circuit packages 710, in turn, may include a plurality of leads 715, wherein at least one of the leads 715 is connected to the conductive layer 705, using a through-hole via, or surface mounting pad 725, for example. The integrated circuit package includes a substrate 755 which has bonding pads 740 electrically connected to the leads 715 by wire bonds 750, as described above. The substrate 755, in turn, supports an integrated circuit 730 which includes a [test] reference domain 760 and a [reference] test domain 770. The integrated circuit 730 may be fabricated apart from, or be fabricated to include the measurement circuit 785, also supported by the substrate 755. Again, the measurement circuit 785 is operatively connected to the reference domain 760 and the test domain 770 to measure the difference between the test and reference voltages developed therein.

The paragraph beginning on page 17, line 22 is amended as follows:

As described previously, an analog-to-digital converter 790, digital-to-analog converter 790, peak detector 790, comparison circuit 790, sample and hold circuit 790, and/or a complete data acquisition system 790, as are well known to those skilled in the art, can be used within the measurement circuit 785, formed as part of the integrated circuit [790] 730, or apart from the integrated circuit [790] 730, and supported by the substrate 755 to measure the magnitude and/or wave shape of the voltage V_{gnd} . Thus, there is no real limit to the number of devices, circuits, or methods which may be used within the measurement circuit 785 to measure the magnitude and/or wave shape of the voltage V_{gnd} within the memory circuit module 700.

The paragraph beginning on page 21, line 3 is amended as follows:

Alternatively, the measurement system 900 and measurement circuit 915 may include an analog-to-digital converter 945 which feeds into a digital-to-analog converter 950. Then, the resulting analog signal can be sent directly to one or more output terminals 970 for access by the

operator of the oscilloscope 990, or the computer terminal 995. In either case, the user of the ground bounce measurement system 900 constructed and operated in accordance with the teachings of the present invention obtains the primary advantage noted previously, namely, the voltage V_{gnd} can be measured without the parasitic inductance and capacitance introduced by prior art methods involving integrated circuit packages and external probes. External measurement equipment can also be more completely isolated from the measurement apparatus (e.g., due to the isolation provided by the analog-to-digital converter and digital-to-analog converter pair 945, 950), if desired.

The paragraph beginning on page 21, line 15 is amended as follows:

As noted above, a peak detector 955, whose output is sent to an analog-to-digital converter 945, directly to the outputs 970, and/or even to a data acquisition system 960, may also be included as part of measurement circuit 915. Thus, one or more values for V_{gnd} measured by the measurement circuit 915 may be presented continuously at the outputs 970, or [stored] acquired by the data acquisition system 960 for later readout by the attached devices 990 (e.g., oscilloscope) and/or a computer terminal 995.

IN THE ABSTRACT OF THE DISCLOSURE

Please substitute the Abstract in the appendix entitled Clean Version of Abstract for the previous Abstract. Following is a marked-up version of the Abstract:

Abstract of the Disclosure

Ground bounce measurement circuitry, integrated circuit packaging, memory circuit modules, circuit cards, and systems, and methods to form, assemble, and use them are provided. A circuit combination is disclosed which includes an integrated circuit and measurement circuit, constructed so that each may be supported by a single substrate, or enclosed within a single integrated circuit package. The integrated circuit includes a test domain having a test voltage, and a reference domain having a reference voltage. The measurement circuit is operatively connected to the reference domain and the test domain to measure the ground bounce voltage, which is the difference between the test voltage and the reference voltage. The measured value of the ground bounce voltage can then be acquired by a data acquisition system [for later recall], or made immediately available for observation using instrumentation outside of the substrate or